

ITEM: 4

SUBJECT: Review of the Results of the 1992 Rice Pesticide Control Program and Consideration of Recommendations Regarding the 1993 Program

REPORT: Annually since 1984 the Board has reviewed and approved the program for the control of pesticide discharges from rice fields to waters of the Sacramento Valley. This program was established by the Department of Food and Agriculture and is now conducted by the Department of Pesticide Regulation.

In 1990, the Board adopted a Basin Plan amendment that set performance goals for the reduction of pesticide levels through the development and implementation of improved management practices. The plan indicates that the goals for the 1993 season would be set following a review of the latest technical and economic information.

Staff has determined that it would require a Basin Plan amendment to adjust the performance goals from their 1992 levels. Since it may take over a year to obtain final approval for such an amendment, modification of the performance goals prior to the 1993 season is not possible at this time.

Even though performance goals can not be set, the Board can make recommendations regarding the program. Specifically, it appears that the focus of the 1993 program should be on control of aerial drift during pesticide applications, minimizing emergency releases and evaluating seepage as a potential pathway for the movement of pesticides from the fields to the drains.

RECOMMENDATION: Adopt the proposed resolution containing recommendations regarding the 1993 Rice Pesticide Control Program and requesting DPR to report on specific program changes planned for the coming season.

STAFF REPORT ON THE RICE PESTICIDE CONTROL PROGRAM

the Board adopted a Basin Plan amendment addressing pesticides in waters. Included was a program for reducing the discharges of five pesticides used on rice fields. Prior to 1990, these five pesticides had been listed at levels that could impact beneficial uses.

A control program set up numerical performance goals for the period of 1990 through 1992 and indicated that the Board would adjust the goals for 1993 following a review of the latest technical and economic information. Staff has recently determined, however, that any modification of the 1992 performance goals can only be made through a Basin Plan amendment. Since such an amendment would require approval of the State Water Resources Control Board and the Office of Administrative Law to become effective, there is not enough time to modify the performance goals prior to the April through June rice pesticide use period.

The primary use of the performance goals has been by the Department of Pesticide Regulation's Rice Pesticide Control Program. DPR has required modifications in management practices associated with the use of the five chemicals on rice fields in an effort to meet the goals.

Even though the Board can not modify the performance goals, it can make recommendations to DPR regarding the 1993 rice pesticide control effort. Staff has prepared a resolution containing suggested recommendations and requesting that DPR report to the Board on specific changes planned for the 1993 season.

BACKGROUND

For over ten years, the Board has been involved in a multi-agency effort to evaluate and control the discharges of pesticides from rice fields. During the early 1980s, these discharges resulted in fish kills in agricultural drains and were associated with a taste problem in the City of Sacramento water supply.

In 1984, the Department of Food and Agriculture established the Rice Herbicide Control Program to coordinate the efforts of the various agencies and organizations involved in the control effort. This program is now operated by the Department of Pesticide Regulation and has been expanded to address both herbicides and pesticides. Significant reductions in pesticide discharges have been achieved through modification of management practices. The Board has reviewed and approved the program on an annual basis.

As part of a Basin Plan amendment adopted in 1990, the Board adopted a conditional prohibition of discharge for five of the pesticides used on rice. Discharge of irrigation return flows containing carbofuran, malathion, methyl parathion, molinate and thiobencarb is prohibited unless the discharger is following a management practice approved by the Board. To obtain approval, the management practice must be expected to help meet the performance goals in the following table:

TABLE 1
Performance Goals¹ for Management Practices
in $\mu\text{g/l}$

Pesticide	Year			
	1990	1991	1992	1993
Carbofuran	D	0.4	0.4	R
Malathion	I	0.1	R	R
Molinate	30	20	10	R
Methyl parathion	D	0.26	0.13	R
Thiobencarb	3.0	1.5	R	R

¹ Performance goals are daily maxima and apply to all waters designated as freshwater habitat.

D = No numerical goal - control practices under development

I = No numerical goal - sources of discharge to be identified by special study

R = The Regional Board will review the latest technical and economic information to determine if the performance goal should be adjusted

As indicated in the table, the intent was to evaluate technical and economic information prior to the 1993 season and adjust the performance goals if appropriate. Originally, the idea was to make these modifications by resolution. Staff has determined, however, that such adjustments must be made by amending the Basin Plan. Since an amendment is not effective until it is approved by the State Water Resources Control Board and the Office of Administrative Law, there is insufficient time to modify the performance goals prior to the 1993 season. As a result, the 1992 performance goals will apply to 1993.

The Board is scheduled to consider water quality objectives for the above listed five pesticides during 1993. If necessary, performance goals for future years can be adopted as part of the same Basin Plan amendment.

Even though the Board will not be adjusting performance goals, it will be reviewing proposed management practices for the 1993 season. Through this review process, the Board can focus efforts on areas of the program that need further work.

The control of pesticide discharges has focused on water management at the field and district levels. Growers have been required to hold the water for specified times following pesticide use before a discharge is allowed. In many areas, districts have further reduced discharges from the rice growing region into the major rivers by recycling water to the full extent possible during the pesticide use season.

The controls being employed by the growers have been so effective that the monitoring data indicates that secondary sources may be the primary cause of the highest concentrations being detected. These secondary sources may include:

- Drift during aerial application of pesticides
- Emergency releases from treated fields before the end of the regular holding time
- Lateral seepage through berms

Aerial drift and emergency releases were also thought to be the cause of some of the higher concentrations observed in 1991 and last February, the Board, by motion, requested that DPR:

1. Conduct a program to reduce the drift of rice pesticides into surface waters in the 1992 season and report back to the Board on the success of this effort prior to the 1993 season.
2. Compile a report prior to the 1993 season detailing the need for the emergency releases of water from treated fields. This report should address potential alternatives, the impacts that would result if no emergency releases were allowed, and potential mitigation measures.

The information in these reports, which will be reviewed by the Board in February, should help the Board determine where there is potential for further reduction of discharges from these sources. Staff recommends that the Board reiterate the need to take action to reduce drift and emergency releases to the full extent possible and to take strong enforcement when violations of DPR regulations occur.

DPR is planning to conduct a study of pesticide seepage through berms during the 1993 season. Available information is not sufficient to indicate how significant this source may be.

1992 MONITORING RESULTS

A complete set of the 1992 water quality monitoring data is presented in Appendix 1. Concentrations detected are summarized in the following table.

TABLE 2

PESTICIDE	1992 PEAK PESTICIDE CONCENTRATIONS, in $\mu\text{g/l}$			1992 PERFORMANCE GOALS IN $\mu\text{g/l}$
	DRAIN SITES	RIVER SITES	CITY OF SACRAMENTO INTAKE	
CARBOFURAN	0.7	0.3	--	0.4
MALATHION	0.1	--	--	0.1
METHYL PARATHION	0.5	--	--	0.13
MOLINATE	26	<1	0.29	10
THIOBENCARB	9.7	<1	<0.1	1.5

A map of the sampling sites is provided as Figure 1 and graphs of the data from the Colusa Basin Drain at Highway 20 are enclosed as Figures 2-5.

Highlights of the season are as follows:

- The effects of the drought significantly affected water management in the Sacramento Valley during the 1992 rice growing season. Flows in the drains were only a small fraction of normal. This must be taken into consideration when evaluating the concentrations of pesticides detected and when projecting what concentrations may be present in the future.
- The only pesticide detected at the City of Sacramento water intake was molinate. The peak concentration of $0.29 \mu\text{g/l}$ was well below the $20 \mu\text{g/l}$ drinking water standard for this material.
- Despite the fact that the performance goals were not met at all sites, the control practices being used by the rice growers appear to be working. For most of the pesticides, it appears that the peak concentrations are the result of discharges other than those which would occur at the end of the required holding time. Additional detail is provided below on a chemical by chemical basis:

Molinate (active ingredient in the herbicide Ordram)

The holding time for molinate was 28 days, but the peak concentrations in the drains occurred approximately 15 days following the peak application period, indicating that the highest concentrations were not the result of discharge from fields where the water was held as required. Just as

important, the concentrations in the drains 28+ days following the peak application period were below the 10 $\mu\text{g/l}$ performance goal. Adding to the holding time would therefore not reduce the peak concentrations being detected in the drains. While the peak concentrations did not go down in 1992, mass discharge did. For example, estimated mass transport in the Colusa Basin Drain past Highway 20 dropped from 1446 lbs in 1991 to 682 lbs in 1992.

Thiobencarb (active ingredient in the herbicide Bolero)

The thiobencarb performance goal was exceeded in Colusa Basin Drain and Butte Slough both during and following the holding period for the bulk of the treated rice fields. While it is possible that legal releases from a small number of treated fields may have resulted in the observed concentrations, there may also be another mechanism that is responsible for movement of the material into receiving waters. There is no guarantee that increasing the holding time will ensure compliance with the goal. Complicating the assessment of this year's data is the fact that results from the primary lab (ICI Americas, Inc.) are significantly different than those from the secondary lab (Calif. Department of Fish and Game). The secondary lab, which received splits on approximately 13% of the samples, did not detect thiobencarb at over 1.0 $\mu\text{g/l}$ in samples where the primary lab reported up to 5.7 $\mu\text{g/l}$.

Malathion and Methyl Parathion (insecticides)

Most of the samples collected did not have concentrations of malathion or methyl parathion above the detection level, which was 0.1 $\mu\text{g/l}$ for both materials. Malathion was only detected once and methyl parathion five times through the course of the entire season. More significantly, the concentrations spiked up and returned to nondetectable levels by the time the next sample was collected. This means that relatively high concentrations were not consistently present. Also, the timing of the detections coincides more closely with applications than with releases from fields where the water was held as required. Because of this, there is no assurance that adding to the holding time would reduce the peak concentrations observed.

Carbofuran (active ingredient in the insecticide Furadan)

Carbofuran was present in the Colusa Basin Drain from early May to early July. Most of the samples had concentrations at or below the performance goal of 0.4 $\mu\text{g/l}$ and the highest reported concentration was 0.7 $\mu\text{g/l}$. This spans the application and holding time for this material, but there is no apparent primary source of the discharges. Because of this, adding to the holding time may not significantly improve the situation in the drains.

In summary, based on the 1992 monitoring data, there is no clear cut evidence that adding to the holding time will significantly reduce the peak

concentrations being detected in the drains. To effectively deal with these concentrations, the program is going to have to identify sources and devise new control strategies.

Bensulfuron methyl (active ingredient in the herbicide Londax)

Bensulfuron methyl concentrations are being monitored, but it is not one of the pesticides being addressed by the water quality control program. This product was detected at one drain site at concentrations up to 1.88 $\mu\text{g/l}$. There is no performance goal or criterion for this pesticide and the DFG indicates that it is not very toxic to aquatic organisms.

RECOMMENDATION

Staff recommends that the Board adopt the proposed resolution advising DPR that the 1992 performance goals will apply in 1993. The resolution also requests a stronger program to address aerial drift and emergency releases. DPR is requested to report back to the Board on the details of the program prior to the rice growing season.

FIGURE 1

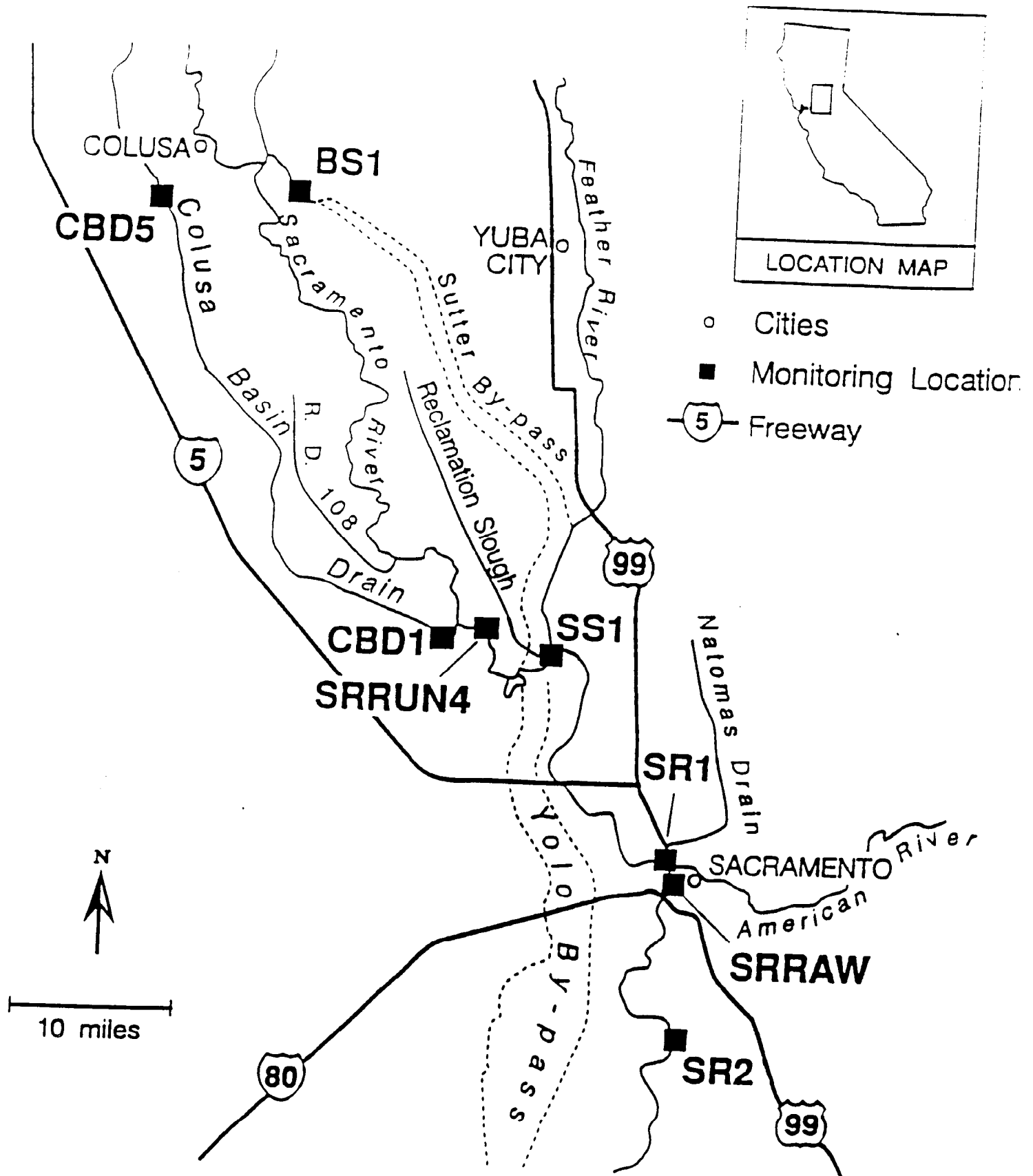


Figure 1. Monitoring sites on Sacramento Valley waterways.

FIGURE 2

COLUSA BASIN DRAIN AT HIGHWAY 20 1992 MOLINATE CONCENTRATIONS

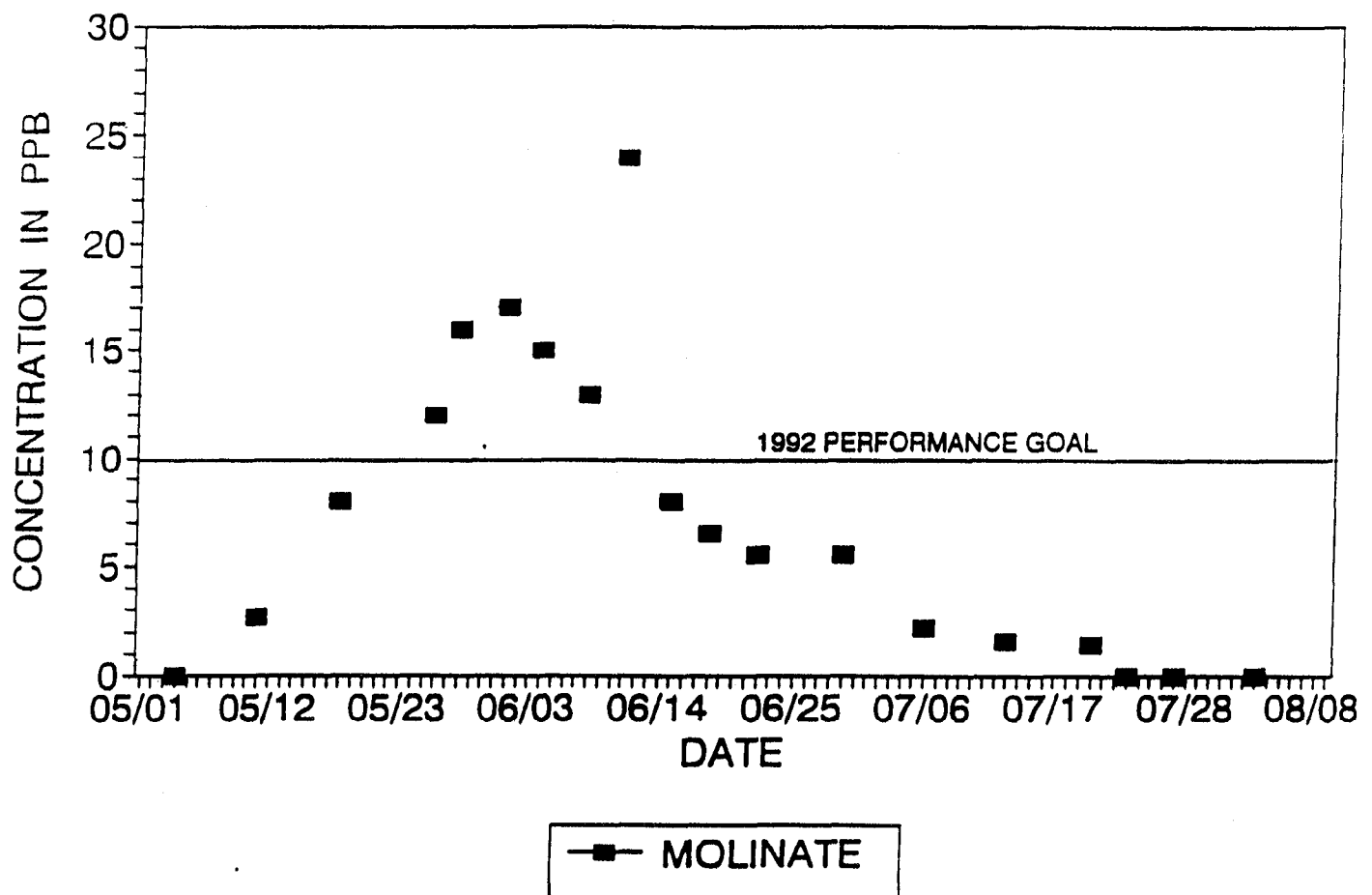


FIGURE 3

COLUSA BASIN DRAIN AT HIGHWAY 20 1992 THIOBENCARB CONCENTRATIONS

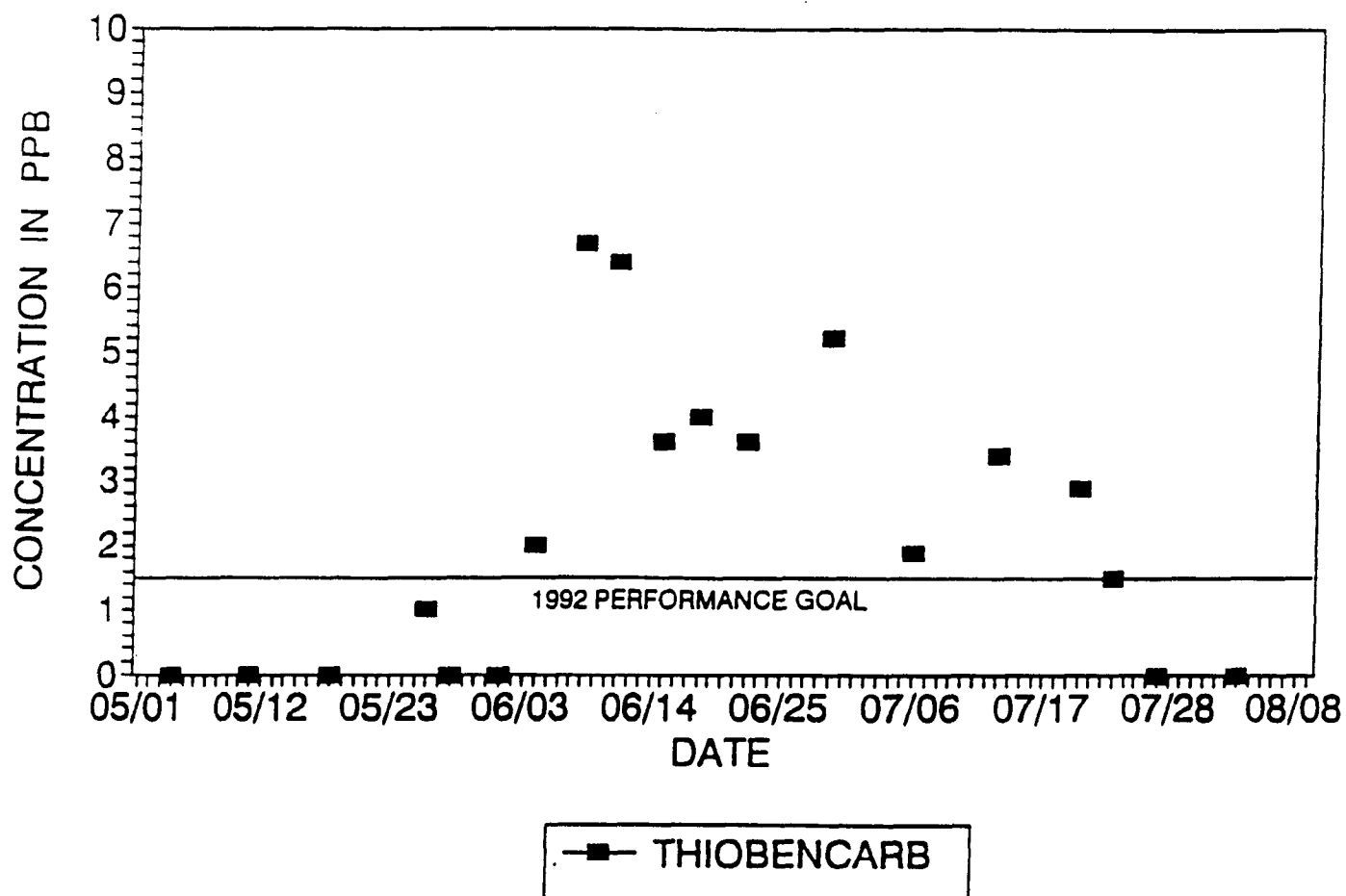
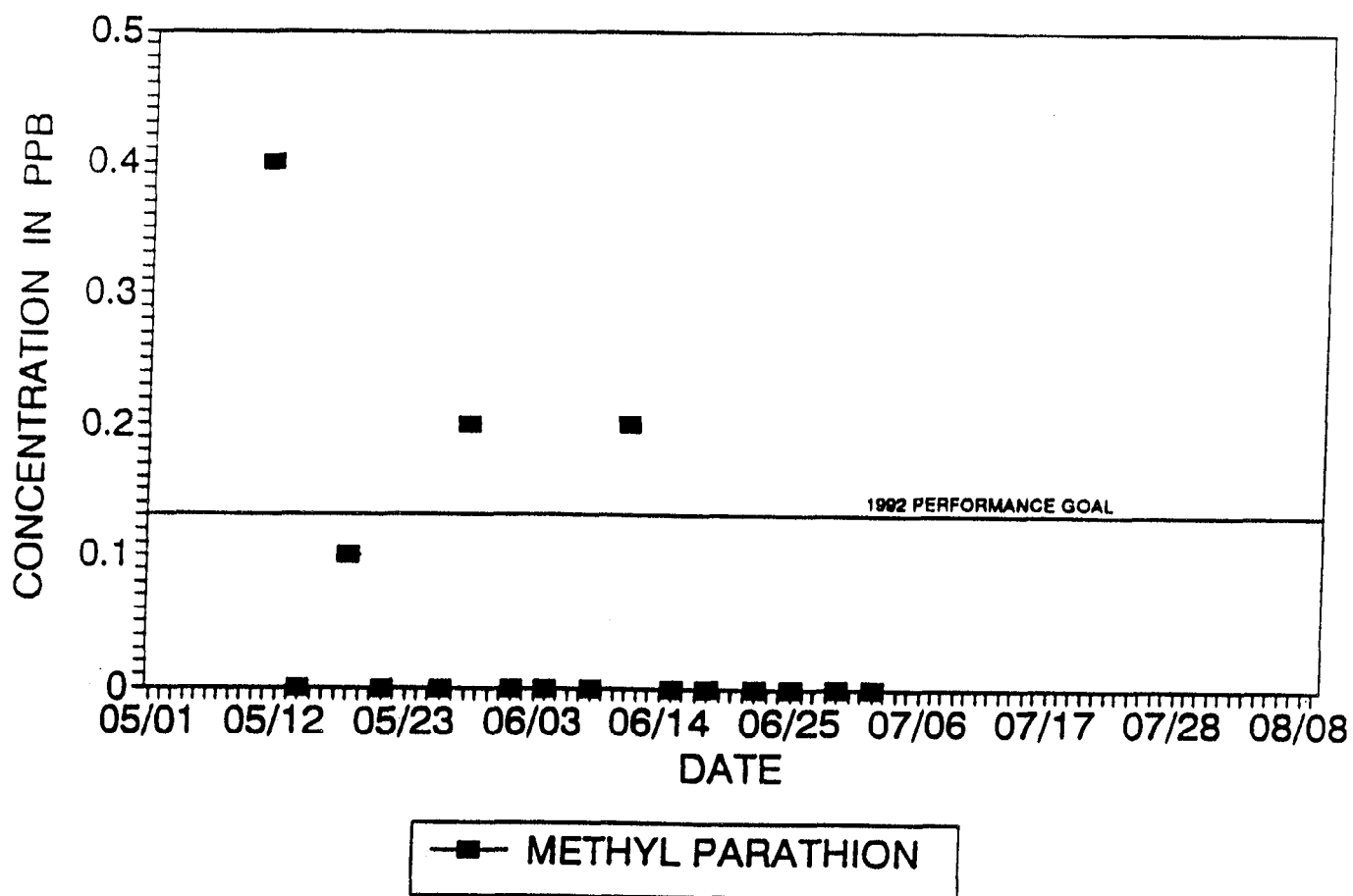


FIGURE 4

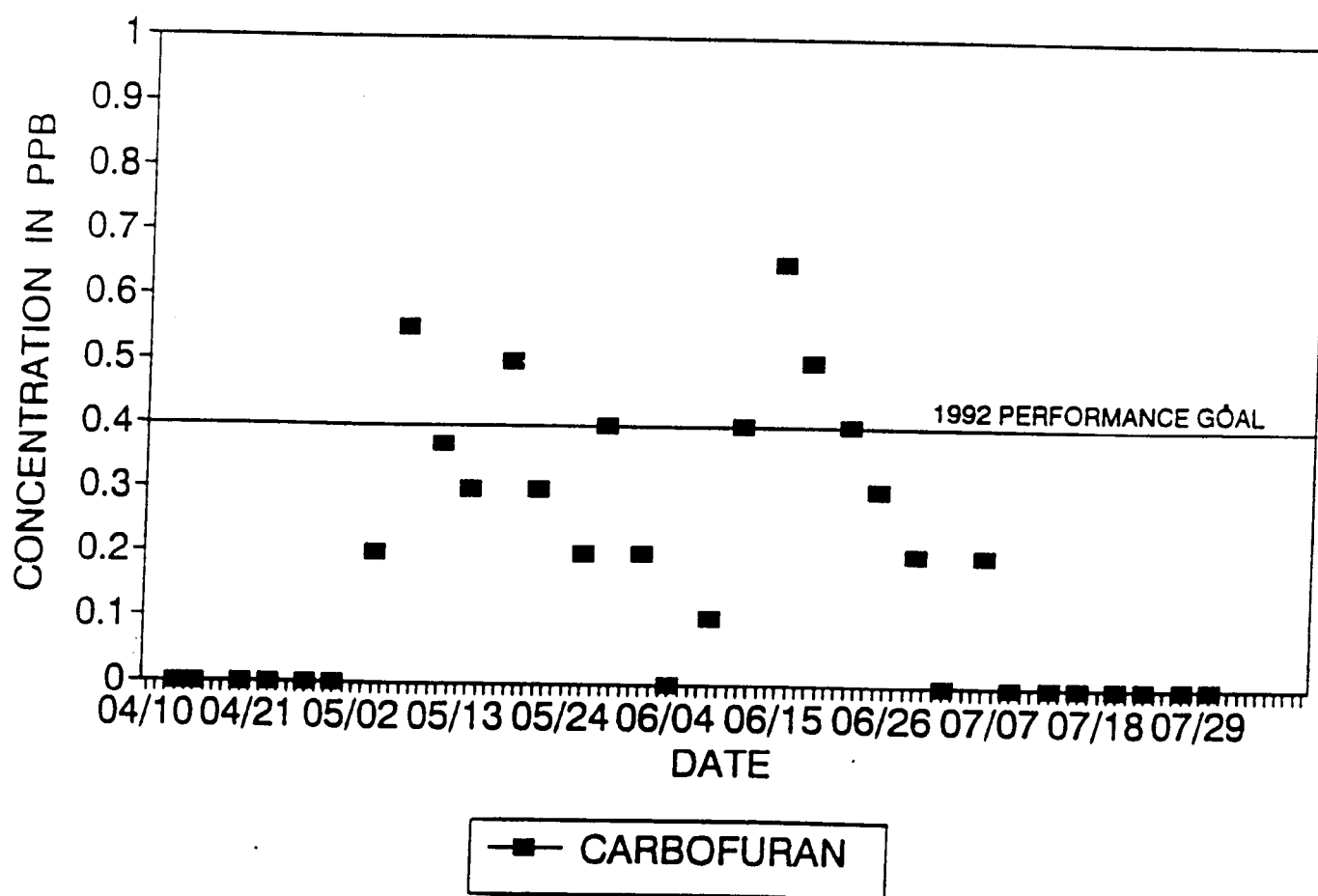
COLUSA BASIN DRAIN AT HIGHWAY 20 1992 METHYL PARATHION CONCENTRATIONS



DFG DATA; LIMIT OF DETECTION = 0.10 PPB

FIGURE 5

COLUSA BASIN DRAIN AT HIGHWAY 20 1992 CARBOFURAN CONCENTRATIONS



FMC DATA; LIMIT OF DETECTION = 0.1 PPB, LIMIT OF QUANTIFICATION = 0.4 PPB

APPENDIX 1

Rice program data compiled/developed by the Department of Pesticide Regulation:

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1.	1	Molinate and thiobencarb concentrations in the Sacramento River at the City of Sacramento intake, 1992.
2.	2	Molinate concentrations in Sacramento Valley waterways, 1992.
3.	3	Peak molinate concentrations in selected Sacramento Valley waterways, 1981-1992
4.	4	Thiobencarb concentrations in Sacramento Valley waterways, 1992.
5.	5	Peak thiobencarb concentrations in selected Sacramento Valley waterways, 1981-1992.
6.	6	Concentrations of carbofuran detected in Sacramento Valley waterways in 1992.
7.	8	Concentrations of methyl parathion detected in Sacramento Valley waterways in 1992.
8.	9	Concentrations of malathion detected in Sacramento Valley waterways in 1992.
9.	10	Concentrations of bensulfuron methyl detected at two sites in the Sacramento Valley in 1992.
10.	11	Estimated mass transport of molinate and thiobencarb in Butte Slough (BS1) and the Colusa Basin Drain at SR20 (CBD5) in 1987-1992.
11.	12	Estimated mass transport of molinate and thiobencarb in the Sacramento River past Sacramento in the years 1982-1992.
12.	13	Acres of rice treated with molinate in Glenn and Colusa Counties and concentrations of molinate in water samples collected from the Colusa Basin Drain at SR20 (CBD5) in 1992.
13.	13	Acres of rice treated with molinate in Butte County and concentrations of molinate in water samples collected from Butte Slough at SR20 (BS1) in 1992.
14.	14	Acres of rice treated with thiobencarb in Glenn and Colusa Counties and concentrations of thiobencarb in water samples collected from the Colusa Basin Drain at SR20 (CBD5) in 1992.

APPENDIX 1 (Cont.)

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| 15. | 14 | Acres treated with thiobencarb in Butte County and concentrations of thiobencarb in water samples collected from Butte Slough at SR20 (BS1) in 1992. |
| 16. | 15 | Carbofuran use on rice in Colusa County, 1992, pre- and post-flood applications, and carbofuran concentrations in the Colusa Basin Drain at Highway 20. |
| 17. | 15 | Carbofuran use on rice in Glenn County, 1992, pre- and post-flood applications, and carbofuran concentrations in the Colusa Basin Drain at Highway 20. |
| 18. | 16 | Water flows in the Colusa Basin Drain at SR20 (CBD5) in 1992 versus the five-year average and minimum for 1987-1991. |
| 19. | 16 | Water flows in Butte Slough at SR20 (BS1) in 1992 versus the five-year average and minimum for 1987-1991. |

Concentrations of molinate and thiobencarb in the Sacramento River at the intake to the City of Sacramento water treatment facility in 1992¹.

Date	Concentration (ppb)		Date	Concentration (ppb)	
	molinate	thiobencarb		molinate	thiobencarb
5/1	ND ¹	ND	5/29	0.22	ND
5/8	ND	ND	6/1	0.22	ND
5/11	ND	ND	6/3	0.13	ND
5/14	ND	ND	6/5	ND	ND
5/18	ND	ND	6/8	ND	ND
5/20	0.13	ND	6/10	ND	ND
5/22	0.11	ND	6/11	ND	ND
5/25	0.11	ND	6/16	ND	ND
5/27	0.29	ND	6/18	ND	ND

1. Samples collected and analyzed by the City of Sacramento.

2. ND None detected. Limit of detection = 0.5¹ppb.

Water Quality Objectives

Molinate

Primary Maximum Contaminant Level = 20 µg/l

Thiobencarb

Primary Maximum Contaminant Level = 70 µg/l

Secondary Maximum Contaminant Level = 1 µg/l

Molinate concentrations in Sacramento Valley waterways¹ in 1992².

Date	Concentration (ppb)						
	CBD1	CBD5	SS1	BS1	SRRUN4	SR1	SR2
5/4	ND ³ (ND) ⁴	ND	ND	ND		ND	ND
5/11	ND (ND)	2.7	8.1	ND		ND	ND
5/18	ND (ND)	8.0	2.0	ND		ND	ND
5/26	3.0 (3.0)	12	12	17	ND	ND	ND
5/28	3.0 (1.9)	16	13	6.0	ND	ND	ND
6/1	4.0 (1.2)	17	15	25	ND	ND	ND
6/4	5.0 (3.5)	15	13	26	ND	ND	ND
6/8	4.0 (2.4)	13	7.1	23	ND	ND	ND
6/11	4.2 (3.2)	24	7.7	22	ND	ND	ND
6/15	ND (2.1)	8.0	5.8	25	ND	ND	ND
6/18	6.2 (4.1)	6.5	4.3	9.6	ND	ND	ND
6/22	5.4 (3.8)	5.5	2.7	5.7		ND	ND
6/29	3.7 (2.4)	5.5	2.6	3.0		ND	
7/6	2.2 (1.5)	2.2	1.4	2.8		ND	ND
7/13	2.6	1.6	1.2	1.8			
7/20	1.4	1.4	ND			ND	
7/23	1.2	ND	ND			ND	
7/27	ND	ND	ND	1.0			
8/3	ND	ND	ND	ND			

- CBD1 Colusa Basin Drain at Roads 109 and 99E near Knight's Landing in Yolo County.

CBD5 Colusa Basin Drain at Highway 20 in Colusa County.

SS1 Sacramento Slough at DWR gauge station in Sutter County.

BS1 Butte Slough at Highway 20 in Sutter County.

SRRUN4 Sacramento River, 3 km downstream from confluence with Colusa Basin Drain.

SR1 Sacramento River at Village Marina in Sacramento County.

SR2 Sacramento River at Freeport Bridge in Sacramento County.
- Samples collected by the California Department of Fish and Game (CDFG) and analyzed by ICI Americas, Inc.
- ND None detected, limit of detection = 1.0 ppb.
- Values in parentheses are results of analyses performed by CDFG on replicate samples.

Peak molinate (Ordram®) concentrations in selected Sacramento Valley waterways¹ in 1981 - 1992¹.

Year	Concentration (ppb)				
	CBD1	CBD5	SS1	BS1	SR1
1981	340	357	2		
1982	204	697		187	27
1983	211	228	68		7
1984	110	120	44		21
1985	95	100	49		16
1986	77	88	30		11
1987	43	53	22	44	7.6
1988	67	89	30	52	8.0
1989	51	60	30	43	6.0
1990	51	59	40	36	8.9
1991	18	17	9.6	26	1.3
1992	6.2	24	15	26	ND ³

1. CBD1 Colusa Basin Drain at Roads 109 and 99E near Knight's Landing in Yolo County.
 CBD5 Colusa Basin Drain at Highway 20 in Colusa County.
 SS1 Sacramento Slough at DWR gauge station in Sutter County.
 BS1 Butte Slough at Highway 20 in Sutter County.
 SR1 Sacramento River at Village Marina in Sacramento County.
2. Blanks indicate that no data are available.
3. ND None detected, limit of detection = 1.0 ppb.

Thiobencarb concentrations in Sacramento Valley waterways¹ in 1992².

Date	Concentration (ppb)						
	CBD1	CBD5	SS1	BS1	SRRUN4	SR1	SR2
5/4	ND (ND)	ND	ND	ND		ND	ND
5/11	ND (ND)	ND	ND	ND		ND	ND
5/18	ND (ND)	ND	ND	ND		ND	ND
5/26	ND (ND)	1.0	ND	2.0	ND	ND	ND
5/28	1.0 (ND)	ND	ND	ND	ND	ND	ND
6/1	2.0 (ND)	ND	1.0	4.0	ND	ND	ND
6/4	2.0 (ND)	2.0	2.0	3.0	ND	ND	ND
6/8	2.4 (ND)	6.7	1.4	8.1	ND	ND	ND
6/11	3.1 (ND)	6.4	1.8	9.1	ND	ND	ND
6/15	ND (ND)	3.6	1.3	9.7	ND	ND	ND
6/18	4.2 (ND)	4.0	1.3	5.7	ND	ND	ND
6/22	4.0 (ND)	3.6	ND	3.6		ND	ND
6/29	5.7 (ND)	5.2	1.2	3.1		ND	
7/6	2.9 (ND)	1.9	ND	2.7		ND	ND
7/13	3.2	3.4	ND	2.5			
7/20	2.3	2.9	ND			ND	
7/23	2.8	1.5	ND			ND	
7/27	1.9	ND	ND	1.8			
8/3	1.1	ND	ND	1.0			

- CBD1 Colusa Basin Drain at Roads 109 and 99E near Knight's Landing in Yolo County.

CBD5 Colusa Basin Drain at Highway 20 in Colusa County.

SS1 Sacramento Slough at DWR gauge station in Sutter County.

BS1 Butte Slough at Highway 20 in Sutter County.

SRRUN4 Sacramento River, 3 km downstream from confluence with Colusa Basin Drain.

SR1 Sacramento River at Village Marina in Sacramento County.

SR2 Sacramento River at Freeport Bridge in Sacramento County.
- Samples collected by the California Department of Fish and Game (CDFG) and analyzed by ICI Americas, Inc.
- ND None detected, limit of detection = 1.0 ppb.
- Values in parentheses are results of analyses performed by CDFG on replicate samples.

Peak thiobencarb (Bolero®) concentrations in selected Sacramento Valley waterways¹ in 1981 - 1992².

Year	Concentration (ppb)				
	CBD1	CBD5	SS1	BS1	SR1
1981	21	23	2		
1982	57	170		10	6
1983	11.3	9.0	4.9		0.8
1984	7.5	14.0	7.8		1.0
1985	19	18	11		4.1
1986	7.4	6.9	3.8		1.1
1987	3.7	1.5	0.6	ND ³	ND
1988	4.5	0.6	ND	1.0	ND
1989	1.34	0.55	ND	0.98	ND
1990	ND	ND	ND	2.0	ND
1991	ND	ND	ND	ND	ND
1992	5.7	6.7	2.0	9.7	ND

1. CBD1 Colusa Basin Drain at Roads 109 and 99E near Knight's Landing in Yolo County.
 CBD5 Colusa Basin Drain at Highway 20 in Colusa County.
 SS1 Sacramento Slough at DWR gauge station in Sutter County.
 BS1 Butte Slough at Highway 20 in Sutter County.
 SR1 Sacramento River at Village Marina in Sacramento County.
2. Blanks indicate that no data are available.
3. ND Not detected. Different detection limits were reported during this period, all of which were less than or equal to 1.0 µg/L.

Concentrations of carbofuran (Furadan®) detected in Sacramento Valley waterways¹ in 1992, reported by two laboratories².

Date Collected	Carbofuran (ug/L)						
	CBD1		CBD5		SS1	BS1	SR1
	FMC	CDFG	FMC	CDFG	FMC	FMC	FMC
4/13	ND ³		ND	ND	ND		ND
4/15	ND		ND	ND	ND	ND	ND
4/20	ND		ND	ND	ND	ND	ND
4/23	ND		ND	ND	ND	ND	ND
4/27	ND		ND	ND	ND	0.1	ND
4/30	ND		ND	ND	ND	ND	ND
5/4	ND		0.2	ND	0.1	0.2	ND
5/7	ND	ND	0.4 [*]	0.3	0.3	0.1	ND
			0.7				
5/11	ND	ND	0.6 ^s	0.2	0.2 [*]	0.1 [*]	ND
			0.3		ND	0.1	
			0.2				
5/14	ND	ND	0.3	0.2	0.4 [*]	ND	0.3 ^s
					ND		ND
							ND
5/18	ND	ND	0.5 [*]	0.2	ND	ND	ND
			0.5				
5/21	ND	ND	0.3	0.1	ND	0.2	ND
5/26	ND	ND	0.2	ND	ND	ND	ND
5/28	ND	ND	0.4 [*]	0.2	ND	0.4	ND
			0.4				
6/1	ND [*]	ND	0.2	ND	ND	0.2 [*]	ND
	ND					0.3	
6/4	0.3	ND	ND ^s	ND	0.2	0.2 [*]	ND [*]
			ND			0.3	ND
			ND				
6/8	ND [*]	ND	0.1	ND	0.1	0.1	0.1
	ND						
6/11	ND [*]	ND	0.4	0.4	ND	ND	ND
	ND						
6/15	ND	ND	0.6 [*]	0.2	ND	ND	ND
			0.7				
6/18	0.3	0.2	0.5 [*]	0.1	ND	ND	ND ⁶
			0.5				
6/22	0.1	ND	0.4	0.2	ND	ND	ND
6/25	ND	ND	0.3	0.2	ND	ND	ND
6/29	ND	ND	0.2	0.3	ND	ND	ND
7/2	ND	ND	ND	0.2	ND	ND	ND
7/6	ND	ND	0.2	ND	ND	0.2	ND
7/9	ND		ND	ND	ND	0.3	ND
7/13	ND		ND	ND	ND	0.2	ND
7/16	ND		ND	ND	ND	ND	ND
7/20	ND		ND	ND	ND	ND	ND
7/23	ND		ND	ND	ND	ND	
7/27	ND		ND	ND	ND	ND	ND
7/30	ND		ND	ND	ND	0.1	ND

1. CBD1 Colusa Basin Drain at Roads 109 and 99E near Knight's Landing in Yolo County.
CBD5 Colusa Basin Drain at SR 20 in Colusa County.
SS1 Sacramento Slough at DWR gauge station in Sutter County.
BS1 Butte Slough at Highway 20 in Colusa County.
SR1 Sacramento River at Village Marina in Sacramento County.
2. CDFG California Department of Fish and Game, Water Pollution Control Laboratory, Rancho Cordova.
FMC FMC Corporation, Agricultural Chemical Group, Richmond, CA.
3. ND None detected, limit of detection = 0.1 ppb. FMC reported a limit of quantitation of 0.4 ppb.

No entry indicates the site was not sampled for analysis by that laboratory.

4. Two independent analyses were performed on the same sample.
5. Three independent analyses were performed on the same sample.
6. Sample was subjected to repeated analyses, with results ranging from ND to >9 ug/L. These unusual results, and the unstable nature of the detected chemical, suggest the detector response was due to an interferent and not to carbofuran.

Concentrations of methyl parathion detected in Sacramento Valley waterways¹ in 1992, reported by two laboratories².

Date Collected	Methyl parathion (ppb)			
	CBD1		CBD5	SS1
	CDFG	CDFA	CDFG	CDFG
5/4	ND	ND		ND
5/7	ND	ND		ND
5/11	ND		0.4	0.5
5/14	ND	ND	ND	ND
5/18	ND	ND	0.1	ND
5/21	ND	ND	ND	ND
5/26	ND	ND	ND	ND
5/28	ND	ND	0.2	ND
6/1	ND	ND	ND	ND
6/4	ND	ND	ND	ND
6/8	ND	ND	ND	ND
6/11	ND	ND	0.2	ND
6/15	ND	ND	ND	ND
6/18	ND	ND	ND	ND
6/22	ND	ND	ND	ND
6/25	ND	ND	ND	ND
6/29	ND	ND	ND	ND
7/2	ND	ND	ND	ND

1. CBD1 Colusa Basin Drain at Roads 109 and 99E near Knight's Landing in Yolo County.
 CBD5 Colusa Basin Drain at SR 20 in Colusa County.
 SS1 Sacramento Slough at DWR gauge station in Sutter County.
2. CDFG California Department of Fish and Game, Water Pollution Control Laboratory, Rancho Cordova.
 CDFA California Department of Food and Agriculture, Chemistry Laboratory Services, Sacramento.
3. ND None detected, limits of detection = 0.10 ppb (CDFG) and 0.05 ppb (CDFA).

Concentrations of malathion detected in Sacramento Valley waterways¹ in 1992, reported by two laboratories².

Date Collected	Malathion (ppb)			
	CBD1		CBD5	SS1
	CDFG	CDFA	CDFG	CDFG
5/4	ND	ND	ND	ND
5/7	ND	ND	ND	ND
5/11	ND		ND	ND
5/14	ND	ND	ND	ND
5/18	ND	ND	ND	ND
5/21	ND	ND	ND	ND
5/26	ND	ND	ND	ND
5/28	ND	ND	ND	ND
6/1	ND	ND	ND	ND
6/4	ND	ND	ND	ND
6/8	ND	ND	ND	ND
6/11	ND	ND	ND	ND
6/15	ND	ND	ND	ND
6/18	ND	ND	0.1	ND
6/22	ND	ND	ND	ND
6/25	ND	ND	ND	ND
6/29	ND	ND	ND	ND
7/2	ND	ND	ND	ND

1. CBD1 Colusa Basin Drain at Roads 109 and 99E near Knight's Landing in Yolo County.
 CBD5 Colusa Basin Drain at SR 20 in Colusa County.
 SS1 Sacramento Slough at DWR gauge station in Sutter County.
2. CDFG California Department of Fish and Game, Water Pollution Control Laboratory, Rancho Cordova.
 CDFA California Department of Food and Agriculture, Chemistry Laboratory Services, Sacramento.
3. ND None detected, limits of detection = 0.10 ppb (CDFG) and 0.05 ppb (CDFA).

Concentrations of bensulfuron methyl (Londax®) detected at two sites¹ in the Sacramento Valley in 1992².

Date	Bensulfuron methyl (ppb)	
	CBD5	SS1
5/21	ND ³	
5/26	ND	0.525
5/28		0.575
6/1		0.600
6/4		1.88
6/11	ND	ND

1. CBD5 Colusa Basin Drain near SR 20 in Colusa County.
 SS1 Sacramento Slough at DWR gauge station in Sutter County.
2. Samples collected by the California Department of Fish and Game and analyzed by Morse Laboratories under contract with Du Pont.
3. ND None detected, limit of detection = 0.5 ppb.

Estimated mass transport of molinate and thiobencarb in Butte Slough (BS1) and the Colusa Basin Drain at SR20 (CBD5) in 1987 - 1992.

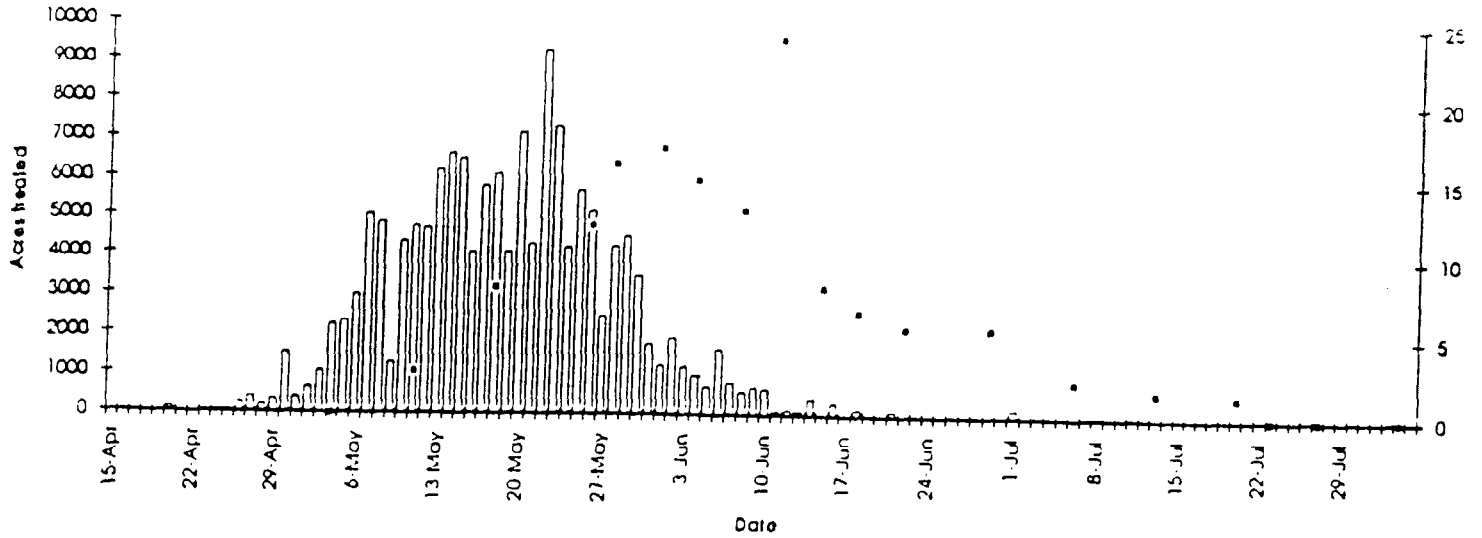
Year	Lbs transported			
	Molinate		Thiobencarb	
	BS1	CBD5	BS1	CBD5
1987	1,759	6,424	0	72
1988	3,079	10,252	19	21
1989	1,897	5,948	19	12
1990	2,366	4,000	57	21
1991	414	1,446	0	0
1992	61	682	14	223
1993		5414		223
1994		193		223

Estimated mass transport of molinate and thiobencarb in the Sacramento River past Sacramento in the years 1982-1992.

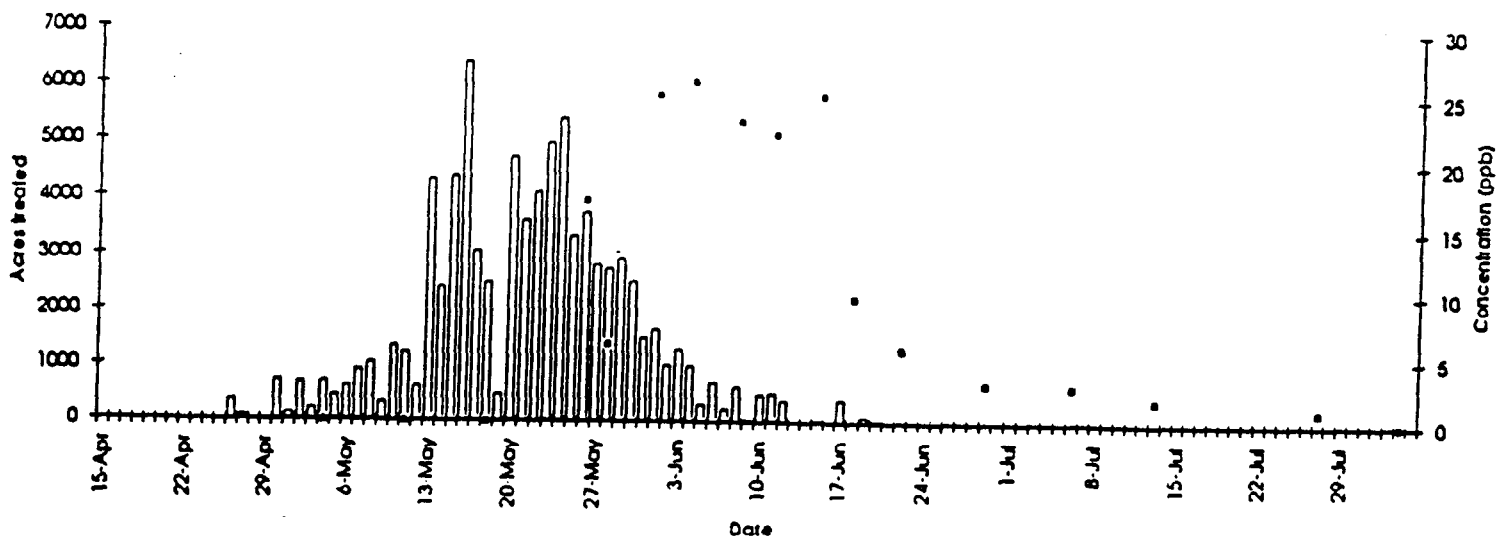
Year	Kg (pounds) Transported			
	molinate		thiobencarb	
1982	18,464.9	(40,666.9)	1	
1983 ²	2,752.9	(6,056.5)	623.7	(1,372.2)
1984	7,352.0	(16,174.4)	715.2	(1,573.5)
1985	6,014.8	(13,232.5)	2,317.5	(5,098.6)
1986	4,622.1	(10,168.7)	845.7	(1,860.6)
1987	2,342.3	(5,153.2)	22.8	(50.2)
1988	3,194.2	(7,027.2)	68.1	(149.8)
1989	1,984.1	(4,365.1)	11.4	(25.1)
1990	3,204.1	(7,049.1)	51.4	(113.1)
1991	99.2	(217.9)	0	(0) ³
1992	56.6	(176.9)	0	(0)
		124.7		

1. Mass transport was not calculated due to incomplete monitoring data.
2. The Colusa Basin Drain, a major agricultural drainage canal, did not contribute to the mass transport at Sacramento because the drain was routed into the Yolo Bypass during unusually high Sacramento River flows.
3. Thiobencarb was not detected in the Sacramento River in 1991 and 1992 (limit of detection = 0.1 ppb).

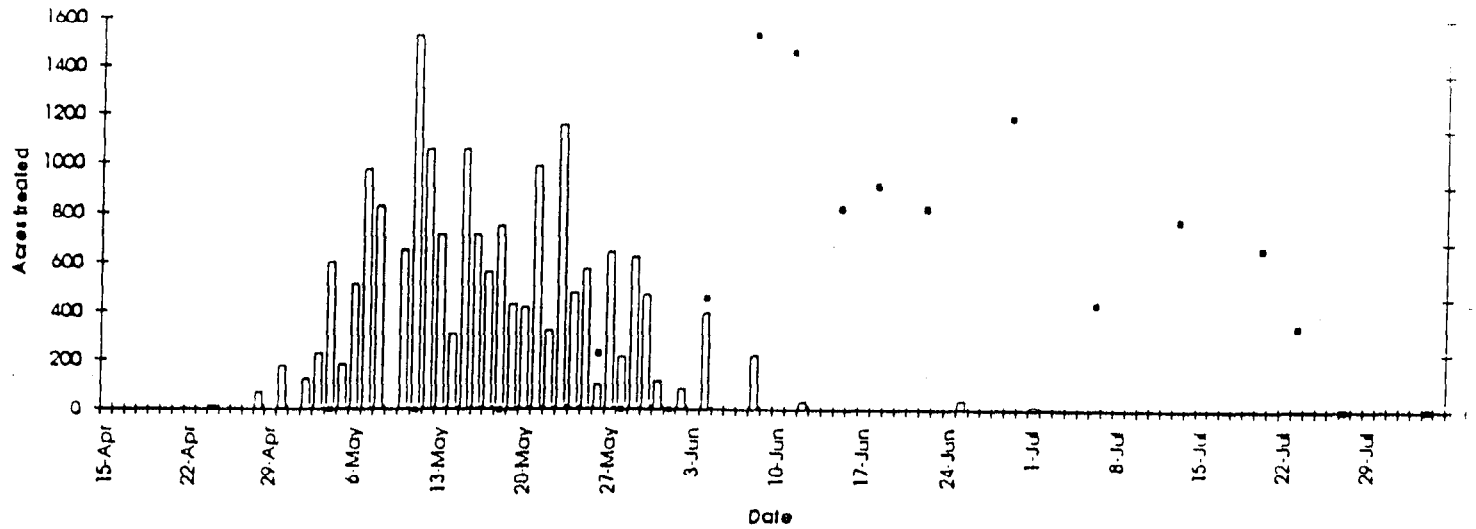
Acres of rice treated with molinate in Glenn and Colusa Counties (bars) and concentrations of molinate in water samples collected from the Colusa Basin Drain at SR20 (CBDS) (squares) in 1992.



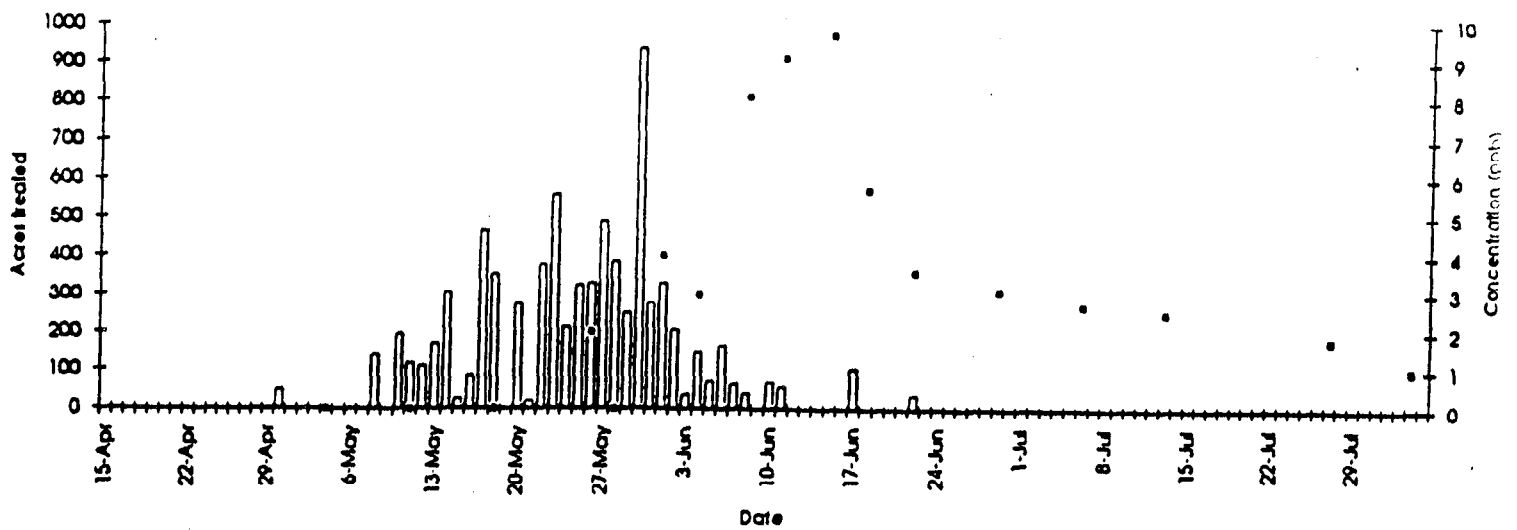
Acres of rice treated with molinate in Butte County (bars) and concentrations of molinate in water samples collected from Butte Slough at SR20 (BS1) (squares) in 1992.



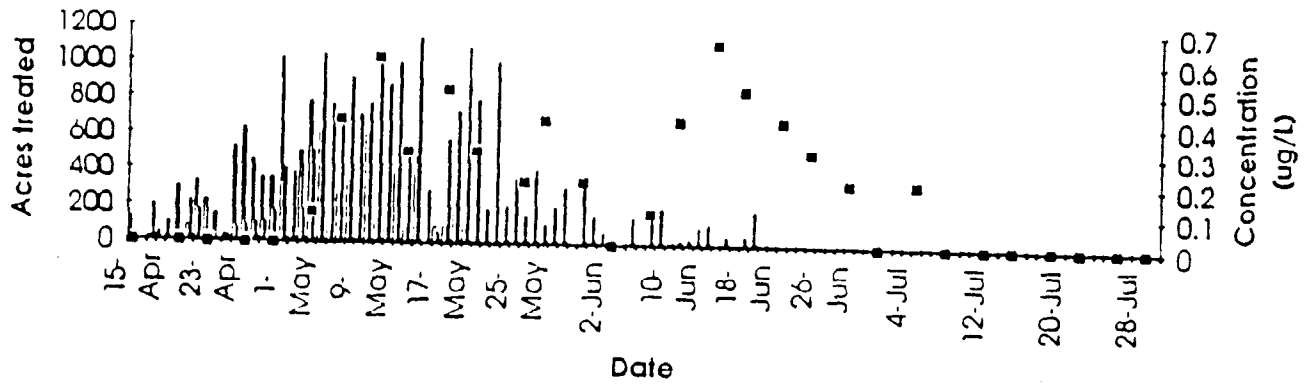
Acres treated with thiobencarb in Glenn and Colusa Counties (bars) and concentrations of thiobencarb in water samples collected from the Colusa Basin Drain at SR20 (CBD5) (squares) in 1992.



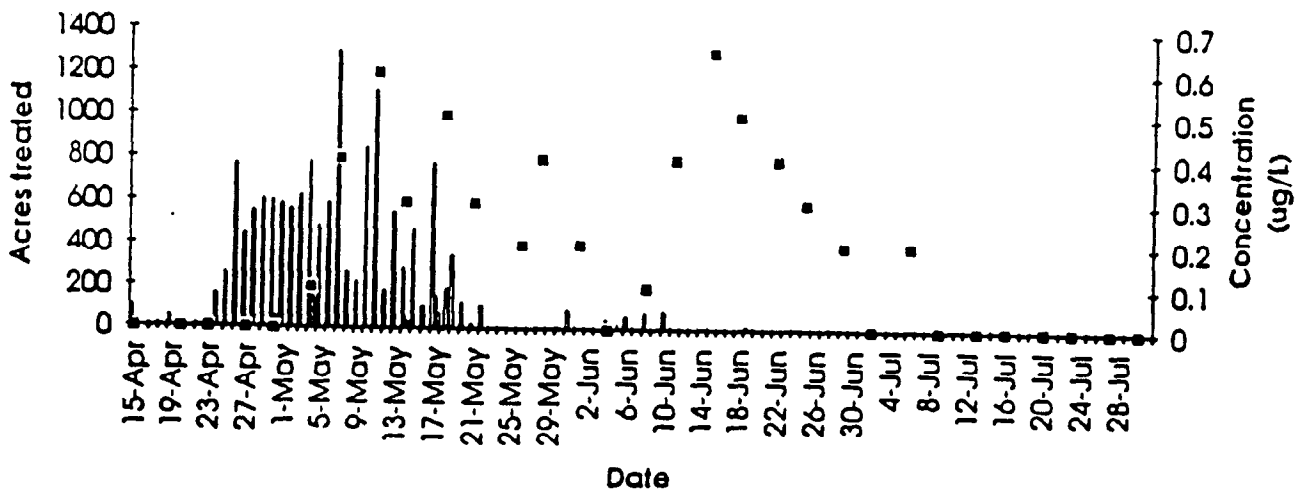
Acres treated with thiobencarb in Butte County (bars) and concentrations of thiobencarb in water samples collected from Butte Slough at SR20 (BS1) (squares) in 1992.



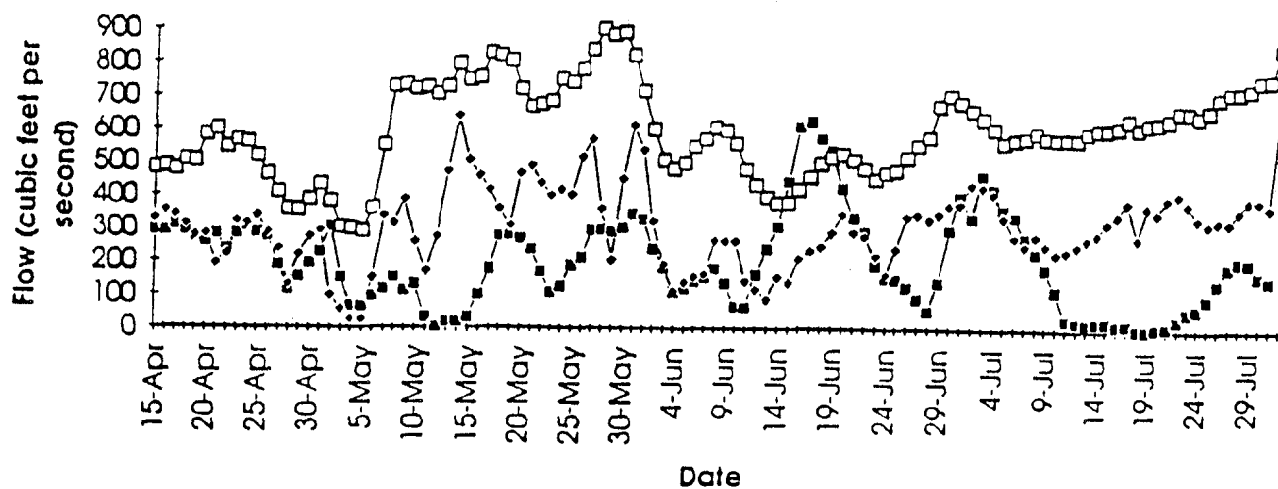
Carbofuran use on Rice in Colusa County, 1992, pre- and post-flood Applications, and Carbofuran Concentrations in the Colusa Basin Drain at Hwy. 20.



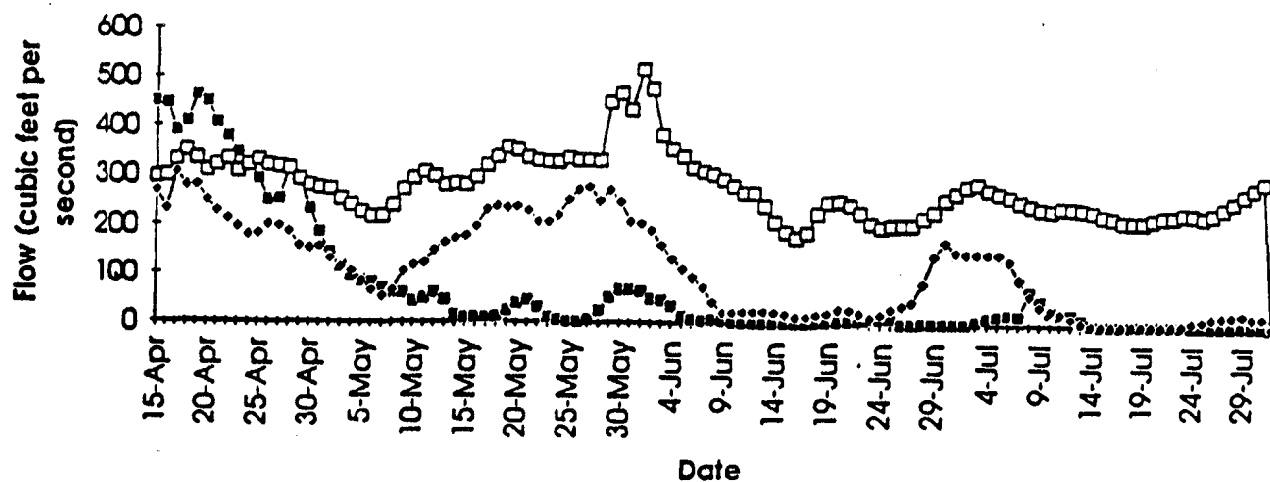
Carbofuran use on Rice in Glenn County, 1992, pre- and post-flood Applications, and Carbofuran Concentrations in the Colusa Basin Drain at Hwy. 20.



Water flows in the Colusa Basin Drain at SR20 (CBD5) in 1992 (filled squares) versus the five-year average (open squares) and minimum (filled diamonds) for 1987-1991.



Water flows in Butte Slough at SR20 (BS1) in 1992 (filled squares) versus the five-year average (open squares) and minimum (filled diamonds) for 1987-1991.



CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

RESOLUTION NO. 93-

RECOMMENDATIONS TO DEPARTMENT OF PESTICIDE REGULATION
REGARDING THE 1993 RICE PESTICIDE CONTROL PROGRAM

WHEREAS, The California Regional Water Quality Control Board, Central Valley Region, (hereafter Board) adopted the Water Quality Control Plan, second edition, (hereafter Basin Plan) for the Sacramento River, Sacramento-San-Joaquin Delta and San Joaquin Basins; and

WHEREAS, The State Water Resources Control Board (hereafter State Board) approved the Basin Plan on 22 March 1990; and

WHEREAS, The Board adopted an amendment to the Basin Plan addressing pesticides in inland surface waters on 26 January 1990; and

WHEREAS, The 26 January 1990 amendment to the Basin Plan was approved by the State Board on 15 February 1990; and

WHEREAS, The Basin Plan sets performance goals for the pesticides carbofuran, malathion, methyl parathion, molinate and thiobencarb and prohibits the discharge of irrigation return flows containing these materials unless the discharger is following management practices approved by the Board; and

WHEREAS, The Basin Plan indicates that the Board would consider adjusting the performance goals for the five pesticides prior to 1993 on the basis of new technical and economic information. Such adjustment would require an amendment to the Basin Plan; and

WHEREAS, There is insufficient time to amend the Basin Plan prior to the 1993 season, but the Board is scheduled to amend the Basin Plan prior to the end of 1993 and will update performance goals at that time; and

WHEREAS, The Department of Pesticide Regulation (DPR) has a Rice Pesticide Control Program to reduce the off-target movement of pesticides applied to rice fields and also regulates application of pesticides by aerial applicators; and

WHEREAS, The 1992 monitoring data appears to show that drift from aerial applications, emergency releases, seepage, or other unidentified sources may be the primary causes of the peak concentrations observed; and

WHEREAS, The Board wishes to make recommendations to DPR with respect to the 1993 Rice Pesticide Control Program; and

WHEREAS, The Board, in a public meeting, heard and considered all comments pertaining to proposed recommendations for the 1993 Rice Pesticide Control Program: Therefore be it

RESOLUTION NO. 93-
RECOMMENDATIONS TO DEPARTMENT OF PESTICIDE
REGULATION REGARDING THE 1993 RICE
PESTICIDE CONTROL PROGRAM

-2-

RESOLVED, That the 1992 performance goals for carbofuran, malathion, methyl parathion, molinate and thiobencarb shall apply to the Rice Pesticide Control Program until the Basin Plan is amended; and be it further

RESOLVED, That DPR is requested to focus program development and enforcement activities on drift from aerial applications, emergency releases, seepage through berms and other sources that are contributing to pesticide releases from fields following required holding times; and be it further

RESOLVED, That DPR is requested to provide information regarding proposed management practices and other aspects of the Rice Pesticide Program, so that it can be reviewed by the Board prior to the 1993 season.

I, WILLIAM H. CROOKS, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of a Resolution adopted by the California Regional Water Quality Control Board on 29 January 1993.

WILLIAM H. CROOKS, Executive Officer